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(54) **PULSE SAMPLED OPTICAL FIBER HYDROPHONE ARRAY (U)**

(75) Inventors: **Eugene L. Green**, New London, CT (US); **Gerald E. Holmberg**, Quaker Hill, CT (US); **Jeffrey C. Gremillion**, Voluntown, CT (US)

(73) Assignee: **The United States of America as represented by the Secretary of the Navy**, Washington, DC (US)

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(58) **Field of Search** 367/140, 149; 385/12, 13; 250/227.11, 227.14

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Primary Examiner—Daniel T. Pihulic

(74) *Attorney, Agent, or Firm*—Michael J. McGowan; Michael F. Oglo; Prithvi C. Lall

(57) **ABSTRACT**

An array through a first to a second side of a three-sided junction, accessed remotely by a single mode fiber transmits a light pulse sequence to the array and receives sound modulated return light signals via the second to a third side of the junction. Within each hydrophone, butt coupled fiber joints form a continuous structure, encapsulated within a compressible plastic tube for mechanical stability. Tube volume expands and contracts linearly with variations in acoustic pressure thereby proportionally modulating the optical path therethrough. Each joint is a partial reflector reflects part of the incident light beam back via the second to third side of the junction to a posthydrophone compensating interferometer which compensates for path difference between equally spaced array joints; From the third side of the junction the reflections from the butt coupled fiber joints pass through a light detector and signal processor. Interference is produced between reflected light beams from successive joint pairs, from which phase modulation due to each hydrophone may be obtained. The partially reflecting joints thus permit serial sampling of the phase modulation of light as a function of position. Light reflected from the fiber lead/array joint provides a signal that is proportional to light source intensity variations and perturbation effects of the lead which may be cancelled. Since the lead is a propagating medium for phase modulated light beams from all joints, lead-induced phase noise is not present. Since path differences between interferring beams is matched precisely by the compensating interferometer, light source phase noise is cancelled. In an important variation of the invention the compensating interferometer is located in the fiber through which the array is accessed, ahead of the three-sided optical junction. Pursuant to this variation of invention the parts of the incident light beam that are similarly reflected back from the joints and pass from the second to third sides of the junction, but there is no compensating interferometer in the path from the third side of the junction to the light detector and a signal processor.

16 Claims, 7 Drawing Sheets